Amendments to the Claims:

This listing of claims (with additions underlined and deletions struck through) will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Withdrawn) A method for underwater hydrocarbon transport, the method comprising:
   A) providing a pipe-in-pipe apparatus comprising:
      1) a carrier pipe;
      2) a flow line mounted within the carrier pipe; and
      3) at least one spacer within the carrier pipe, the spacer providing structural support and maintaining the relative positions of the carrier pipe and the flow line, the spacer enabling the carrier pipe to withstand greater external pressures without structural failure;
   B) placing the pipe-in-pipe apparatus underwater at a depth at which the water pressure exceeds the radial collapse strength of the carrier pipe absent the structural support provided by the spacer, where the carrier pipe undergoes a controlled collapse into catenary-like surfaces between the spacers.

2. (Withdrawn) The method of claim 1, further comprising the step of flowing a hydrocarbon through the carrier pipe.

3. (Withdrawn) The method of claim 2, wherein the hydrocarbon is a natural gas or crude oil.

4. (Withdrawn) The method of claim 1, wherein the spacer serves to partially balance an inward radial force from the seawater pressing against the carrier pipe transmitted from the carrier pipe through the spacer and transmitted to the flow line with the outward radial force of a pressurized hydrocarbon inside the flow line, thereby enabling a reduction in wall thickness and diameter of the flow line and carrier pipe for the same level of thermal insulation.

5. (Withdrawn) The method of claim 1, wherein the spacer includes an aerogel.

6. (Withdrawn) The method of claim 5, wherein the aerogel is selected from the group consisting of silica aerogels, cellulose aerogels, precompressed aerogel and combinations thereof.

7. (Withdrawn) The method of claim 1, wherein the pipe-in-pipe apparatus further comprises an insulation system positioned between the carrier pipe and the flow line.

8. (Withdrawn) The method of claim 7, wherein the insulation system includes an aerogel.

9. (Withdrawn) The method of claim 7, wherein the insulation system has a thermal conductivity less than or equal to 50 mW/m*K.

10. (Withdrawn) The method of claim 7, wherein the pipe-in-pipe apparatus further comprises a thermal insulation strip positioned between the spacer and the flow line.

11. (Withdrawn) The method of claim 10, wherein the insulation strip includes an aerogel.

12. (Withdrawn) The method of claim 1, wherein the wall of the carrier pipe partially collapses below a design depth underwater to form catenary-like surfaces between spacers.

13. (Withdrawn) The method of claim 12, wherein the primary failure mode of the carrier pipe is tensile failure of the catenary-like surfaces as the depth increases.

14. (Withdrawn) The method of claim 1, wherein the pipe-in-pipe apparatus further comprises a weld strip welded to the top of the spacer and to the inner side of the carrier pipe so as to increase the weld integrity and to spread the pressure load transmitted from the carrier pipe to the spacer.

15. (Withdrawn) A pipe-in-pipe apparatus for underwater applications, the apparatus comprising:

a carrier pipe;

a flow line mounted within the carrier pipe; and

at least two spacers within the carrier pipe, the spacers radially separating the carrier pipe from the flow line and providing structural support, said carrier pipe being sufficiently thin, such that the carrier pipe will form a catenary between the spacers under a sufficiently large external compressive loading, and such that the carrier pipe will fail as a consequence of tensile stress in a catenary region of the carrier pipe rather than as a consequence of collapse due to buckling under external pressure.

16. (Withdrawn) The pipe-in-pipe apparatus of claim 15, wherein the carrier pipe, by itself, is incapable of withstanding an external compressive load of 25 MPa due to hydrostatic pressure of sea water, yet the spacer provides sufficient support to enable the carrier pipe to withstand the hydrostatic pressure.

17. (Withdrawn) The pipe-in-pipe apparatus of claim 15, wherein the spacer includes an aerogel strip or an aerogel composite.

18. (Withdrawn) The pipe-in-pipe apparatus of claim 15, further comprising an aerogel strip mounted between the spacer and the flow line, between the spacer and the carrier pipe, or both.

19. (Withdrawn) The pipe-in-pipe apparatus of claim 15, wherein the spacer is in the form of a helical coil about the flow line.

20. (Withdrawn) The pipe-in-pipe apparatus of claim 19, wherein the coil is in the form of a solid rod having a cross section in a shape selected from the group consisting of circular, elliptical, triangular, and trapezoidal.

21. (Withdrawn) The pipe-in-pipe apparatus of claim 19, wherein the coil is in the form of a tube having a cross section in a shape selected from the group consisting of circular, elliptical, triangular, and trapezoidal.

22. (Withdrawn) The pipe-in-pipe apparatus of claim 15, wherein the spacer is in the form of a tubular helical coil about the flow line, and the helical coil tube contains a heat-transfer medium or a vacuum for thermal management of the pipe in pipe.

23. (Withdrawn) The pipe-in-pipe apparatus of claim 22, wherein the helical coil tube contains a heat-transfer medium selected from the group consisting of water, alcohol, glycol, sodium and combinations thereof.

24. (Withdrawn) The pipe-in-pipe apparatus of claim 15, wherein the spacer is in the form of discrete rings spaced at substantially uniform intervals along the axial direction of the flow line.

25. (Withdrawn) The pipe-in-pipe apparatus of claim 24, wherein the rings are made of solid rod or tube having a cross section selected from the group consisting of circular, elliptical, triangular, and trapezoidal.

26. (Withdrawn) The pipe-in-pipe apparatus of claim 15, wherein the overall heat transfer value from the carrier pipe to the flow line is at most 5 W/m^2-°C.

27. (Withdrawn) A method for thermally insulating an externally pressure-loaded structure comprising:

providing a protective outer skin that lacks sufficient thickness to, by itself, sustain an operational external pressure load acting upon it;

providing an underlying structure contained by the protective outer skin;

providing at least one thermally insulating spacer with a spacing or pattern that, while supported by the underlying structure, mechanically supports the thin protective

outer skin, while substantially inhibiting heat transfer between the protective outer skin and the underlying structure;

providing an insulation system having a thermal conductivity less than or equal to 50 mW/m-K substantially filling void volumes formed between the underlying structure and the protective outer skin; and

placing the provided elements in an operational context where the operational external pressure load acts on the protective outer skin.

28. (Withdrawn) The method of claim 27, wherein the structure is a flow line of a pipe-in-pipe apparatus and the protective outer skin is a carrier pipe having a wall thin enough to collapse but supported by the spacers to form catenary-like surfaces between spacers under the operational pressure load.

29. (Withdrawn) The method of claim 27, wherein the structure is an underwater subsea tree of pipelines filled with one or more hydrocarbons.

30. (Withdrawn) The method of claim 27, wherein the structure is an underwater riser.

31. (Withdrawn) The method of Claim 27, wherein the structure is a liquefied natural gas tanker.

32. (Withdrawn) A method for thermally insulating a flow line comprising:

providing a flow line;

providing at least one spacer around the flow line;

providing an outer carrier pipe that is concentrically aligned with the flow pipe so as to create an annular space between the flow line and carrier pipe, wherein the spacer is in that annular space;

providing an insulation system having a thermal conductivity less than or equal to 20 mW/m-K, the insulation system substantially filing void volumes outside the spacer in the annular space between the flow line and carrier pipe; and

flowing a fluid through the flow line.

33. (Withdrawn) The method of claim 32, wherein the insulation system includes an aerogel.

34. (Withdrawn) The method of claim 33, wherein the aerogel is in the form of one or more blankets.

35. (Withdrawn) The method of claim 33, wherein the aerogel is in the form of particles.

36. (Withdrawn) The method of claim 32, wherein the hydrocarbon is liquefied natural gas.

37. (Withdrawn) The method of claim 32, wherein the spacer is made of an insulation material.

38. (Withdrawn) The method of claim 32, wherein the spacer is made of aerogel material.

39. (Withdrawn) The method of claim 1, further comprising monitoring the temperature of the apparatus at a plurality of locations.

40. (Withdrawn) The apparatus of claim 15, further comprising temperature sensors positioned to measure temperature at a plurality of locations in the apparatus.

41. (Withdrawn) The method of claim 27, further comprising monitoring the temperature of the structure at a plurality of locations.

42. (Withdrawn) The method of claim 32, further comprising monitoring the temperature of the system at a plurality of locations.

43. (Withdrawn) The method of claim 1, wherein said spacer is ring-shaped.

44. (Withdrawn) The method of claim 1, further comprising the step of placing an insulator around the flow line, said insulator having a thermal conductivity less than or equal to 50 mW/m-K.

45. (Withdrawn) The method of claim 1, further comprising the step of placing a phase change material that can respond to temperature changes in the flow line by changing phases, around the flow line.

46. (Withdrawn) The method of claim 1, wherein said spacer also comprises an aerogel material.

47. (Withdrawn) The pipe-in-pipe apparatus of claim 15 wherein the spacer is ring-shaped.

48. (Withdrawn) The pipe-in-pipe apparatus of claim 15, further comprising an insulator having a thermal conductivity less than or equal to 50 mW/m-K around the flow line.

49. (Withdrawn) The pipe-in-pipe apparatus of claim 15, wherein said spacer comprises an aerogel material.

50. (Withdrawn) The pipe-in-pipe apparatus of claim 15, wherein said insulator comprises a phase change material that can respond to temperature changes in the flow line by changing phases thereby reducing heat loss from said flow line.

51. (Withdrawn) The method of claim 32, further comprising providing a fiber-reinforcement within said annular space.

52. (Withdrawn) The method of claim 51, wherein the fiber reinforcement provided comprises microfibers, fibrous batting or lofty batting.

53. (Withdrawn) The method of claim 32, wherein said spacer is ring-shaped.

54. (Withdrawn) The method of claim 32, further comprising the step of providing a phase change material that can respond to temperature changes in the flow line by changing phases within said annular space.

55. (Withdrawn) The method of claim 32 , wherein said aerogel is in a particle form.

56. (Previously Presented) A pipe-in-pipe apparatus for thermally insulating a flow line comprising:

    a flow line;

    at least one spacer around the flow line;

    a carrier pipe that is concentrically aligned with the flow line so as to create an annular space between the flow line and carrier pipe, wherein the spacer is in that annular space; and

    an aerogel material within the annular space between the flow line and the carrier pipe.

57. (Previously Presented) The pipe-in-pipe apparatus of claim 56, wherein said aerogel is a fiber reinforced material.

58. (Previously Presented) The pipe-in-pipe apparatus of claim 57, wherein the fiber reinforced material comprises microfibers, fibrous batting or lofty batting.

59. (Previously Presented) The pipe-in-pipe apparatus of claim 56, wherein said insulator comprises a phase change material that can respond to temperature changes in the flow line by changing phases thereby reducing heat loss from said flow line.

60. (Previously Presented) The pipe-in-pipe apparatus of claim 56, wherein said aerogel is in particle form.

61. (Previously Presented) The pipe-in-pipe apparatus of claim 56, wherein said spacer is ring-shaped.

62. (New) The pipe-in-pipe apparatus of Claim 56, wherein the spacer includes an aerogel.

63. (New) The pipe-in-pipe apparatus of Claim 56, wherein the aerogel comprises a material selected from the group consisting of silica aerogels, cellulose aerogels, precompressed aerogels and combination thereof.

64. (New) The pipe-in-pipe apparatus of Claim 56, wherein the thermal conductivity of aerogel is less than or equal to 50 mW/mK.

65. (New) The pipe-in-pipe apparatus of Claim 56, further comprising a thermal insulation strip positioned between the spacer and the flow line.

66. (New) The pipe-in-pipe apparatus of Claim 65, wherein the insulation strip comprises an aerogel.

67. (New) The pipe-in-pipe apparatus of Claim 56, further comprising an aerogel strip mounted between the spacer and the flow line, between the spacer and the carrier pipe, or both.

68. (New) The pipe-in-pipe apparatus of Claim 56, wherein the spacer is in the form of a helical coil.

69. (New) The pipe-in-pipe apparatus of claim 68, wherein the coil is in the form of a solid rod having a cross section in a shape selected from the group consisting of circular, elliptical, triangular, and trapezoidal.

70. (New) The pipe-in-pipe apparatus of claim 68, wherein the coil is in the form of a tube having a cross section in a shape selected from the group consisting of circular, elliptical, triangular, and trapezoidal.

71. (New) The pipe-in-pipe apparatus of claim 56, wherein the spacer is in the form of a tubular helical coil about the flow line, and the helical coil tube contains a heat-transfer medium or a vacuum for thermal management of the pipe in pipe.

72. (New) The pipe-in-pipe apparatus of claim 71, wherein the helical coil tube contains a heat-transfer medium selected from the group consisting of water, alcohol, glycol, sodium and combinations thereof.

73. (New) The pipe-in-pipe apparatus of claim 56, wherein the spacer is in the form of discrete rings spaced at substantially uniform intervals along the axial direction of the flow line.

74. (New) The pipe-in-pipe apparatus of claim 61, wherein the rings are made of solid rod or tube having a cross section selected from the group consisting of circular, elliptical, triangular, and trapezoidal.

75. (New) The pipe-in-pipe apparatus of claim 73, wherein the rings are made of solid rod or tube having a cross section selected from the group consisting of circular, elliptical, triangular, and trapezoidal.

76. (New) The pipe-in-pipe apparatus of claim 56, wherein the overall heat transfer value from the carrier pipe to the flow line is at most 5 W/m^2-°C.

77. (New) The pipe-in-pipe apparatus of claim 56, wherein the structure is an underwater subsea tree of pipelines filled with one or more hydrocarbons.

78. (New) The pipe-in-pipe apparatus of claim 56, wherein the structure is an underwater riser.

79. (New) The pipe-in-pipe apparatus of claim 56, wherein the structure is a liquefied natural gas tanker.

80. (New) The pipe-in-pipe apparatus of claim 56, wherein the aerogel is in the form of one or more blankets.

81. (New) The pipe-in-pipe apparatus of claim 56, wherein the spacer is made of an insulation material.

82. (New) The pipe-in-pipe apparatus of claim 56, wherein the spacer is made of aerogel material.

83. (New) The pipe-in-pipe apparatus of claim 56, further comprising temperature sensors positioned to measure temperature at a plurality of locations in the apparatus.

84. (New) The pipe-in-pipe apparatus of claim 56, wherein the thermal conductivity of aerogel is less than 20 mW/mK.

85. (New) The pipe-in-pipe apparatus of claim 56, further comprising a phase change material.